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AMPHIPOD CRUSTACEANS AND DESCRIPTIONS
OF A NEW GENUS AND TWO
NEW SPECIES

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NOTES ON SOME AMERICAN FRESH-WATER AMPHI-
POD CRUSTACEANS AND DESCRIPTIONS OF A
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Some of the early descriptions of American fresh-water amphipods are so unintelligible and the figures so meager or incorrect that the true status of these species remains in doubt until subsequent authors redescribe and figure them in greater detail from specimens from the type localities. *Stygobromus vitreus*, described by Prof. E. D. Cope from Mammoth Cave, Ky., in 1872, was redescribed and figured by Prof. S. I. Smith in 1888 and placed in the genus *Crangonyx*. I am here describing and figuring this species in greater detail than did Professor Smith and am leaving it in its original genus, *Stygobromus*.

Prof. A. S. Packard in 1881 described *Crangonyx antennatus* from Nickajack Cave, Shellmound, Tenn., and it was later redescribed and figured by Dr. W. P. Hay, who placed it in the genus *Niphargus*. As this genus does not occur in America, I have examined specimens studied by Dr. Hay and find that they belong in the genus *Crangonyx*. I have, therefore, redescribed and figured the species in detail.

Ada L. Weckel in 1907 described a species, *Gammarus caecus*, from a cave in Cuba. The species has ever since remained a mystery and, as it could not, from the structure of the gnathopods, be a *Gammarus*, I have therefore examined her material and find that it is not a *Gammarus*, but represents a new genus, which I am designating *Weckelia*.

In 1931 some amphipods were taken from a slightly brackish pond on the island of Curaçao, which Dr. K. Stephensen¹ placed in a new genus, describing them as *Metaniphargus curasavicus*. The United States National Museum in 1937 received from Harry A. Beatty some amphipods taken on the island of St. Croix, which, upon study, were found to belong to Dr. Stephensen's genus and to represent a new species. I am describing this species as *Metaniphargus beattyi* in honor of its discoverer.

¹ Stephensen, K., Zool. Jahrb. Syst., vol. 64, Nos. 3/5, p. 426, figs. 6-8, 1933.

At the present time there is much active interest in cave explorations, and the cave faunas are receiving their share of attention. As a result, many new and interesting animals are being discovered. Kenneth Dearolf, in 1937 and 1938, while exploring caves in Pennsylvania, collected some rather large amphipods which he sent to the National Museum for identification. These specimens represent a new species which I am describing and naming *Crangonyx dearolfi*.

In 1938 I described the species *Synpleonia pizzini* from the District of Columbia, but gave no figures. I am, therefore, giving a few further notes on this species and adding figures.

New species of American fresh-water Amphipoda are being frequently discovered, and undoubtedly new genera will come to light, so it is scarcely possible at the present time to form a key that will remain effective very long. However, it may prove useful to present in key form our present knowledge of the families and genera of such of these animals as are known to occur in America. I am therefore giving such a key.

The four families *Corophiidae*, *Talitridae*, *Haustoriidae*, and *Gammaridae* are represented in the fresh waters of America.

KEY TO THE FAMILIES OF AMERICAN FRESH-WATER AMPHIPODA

1. Body dorso-ventrally depressed; antenna 2 very strongly developed; gnathopod 2 simple; telson very short and entire.....**Corophiidae**
Body laterally compressed; antenna 2 not strongly developed; gnathopod 2 subchelate; telson entire or cleft.....2
2. Antenna 1 shorter than antenna 2 and without accessory flagellum; mandible without palp; maxilla 1 with small 1-jointed palp; uropod 3 with a single ramus; telson small and entire.....**Talitridae**
Antenna 1 with accessory flagellum; mandible with palp; maxilla 1 with 2-jointed palp; uropod 3 with or without rami; telson entire or cleft....3
3. Antenna 1 shorter than antenna 2, flagellum in female very short, in fully developed male very long; peraeopod 5 much shorter than 4 with second joint greatly expanded; telson deeply cleft.....**Haustoriidae**
Antenna 1 either longer or shorter than 2, but with both antennae rather long and slender; accessory flagellum very short, consisting of one or two short joints, or well developed and consisting of from three to seven joints; peraeopods more or less slender with second joint of peraeopods 3 to 5 only moderately expanded; peraeopod 5 longer or very little shorter than 4; telson entire or cleft.....**Gammaridae**

Family COROPHIIDAE

This family is represented by the genus *Corophium* and the species *C. spinicorne* Stimpson,² which, although described from San Fran-

² Stimpson, Wm., Boston Journ. Nat. Hist., vol. 6, p. 514, 1857.

cisco Bay, Calif., has been taken from the water supply of the city of San Francisco.

Family TALITRIDAE

The genus *Hyalella* is the only one of the family occurring in the fresh waters of America. The species *H. azteca* (Saussure),³ described from Vera Cruz, Mexico, is widely distributed in North and South America, and occurs also in the form *incrimis* Smith,⁴ which lacks the dorsal teeth. Many species of this genus have been described from South America, but it is very probable that a number of them will prove to be synonyms of *H. azteca*. I have examined specimens of *H. ornata* described by Prof. A. S. Pearse⁵ from Vera Cruz, Mexico, and find that it is a synonym of *H. azteca* (Saussure).

Family HAUSTORIIDAE

This family is represented by the genus *Pontoporeia* and by the species *P. affinis* Lindstrom,⁶ which inhabits the cold lakes of the northern United States and Canada. Two species, *P. hoyi*⁷ and *P. filicornis*,⁸ were described by Prof. S. I. Smith, the former from Lake Superior and the latter from Lake Michigan. He at first believed *P. hoyi* to be identical with *P. affinis* of the Scandinavian lakes, but subsequently decided that it represented a new species. The studies of Sven G. Segerstrale⁹ have proved conclusively that *P. hoyi* is identical with *P. affinis* and that *P. filicornis* is the final and mature sexual stage of the male of *P. affinis*. *P. kendalli*, described by Arthur H. Norton¹⁰ in 1909 from a specimen taken in the river below the lock dam in Chamberlain Lake, Me., is also considered by Segerstrale to be a synonym of *P. affinis*. The form *P. filicornis*, described by Adamstone¹¹ in 1928 from Lake Ontario and Lake Nipigon, is re-

³ Saussure, Henri de, Mem. Soc. Phys. et Hist. Nat., Genève, vol. 141, p. 474, pl. 5, fig. 33, 1858.

⁴ Smith, S. I., Rep. U. S. Geol. Surv. Terr., 1873, p. 609, pl. 1, figs. 1, 2, 1874.

⁵ Pearse, A. S., 13th Rep. Michigan Acad. Sci., p. 109, fig. 2, 1911.

⁶ Lindstrom, G., Öfv. Akad. Förh., vol. 12, p. 63, 1855.

⁷ Smith, S. I., Rep. U. S. Fish Comm., 1872-73, vol. 2, p. 647, pl. 2, fig. 5, 1874.

⁸ Idem, p. 649.

⁹ Segerstrale, Sven G., Studien über die Bodentierwelt in Sudfinnländischen Kustengewässern III. Zur Morphologie und Biologie des Amphipoden *Pontoporeia affinis*, nebst einer Revision der *Pontoporeia*-Systematik. Soc. Scientiarum Fennica. Comm. Biol., vol. 7, No. 1, Helsingfors, 1937.

¹⁰ Norton, A. H., Proc. Portland Soc. Nat. Hist., vol. 2, p. 247, fig. 1, 1909.

¹¹ Adamstone, F. B., Trans. Amer. Micros. Soc., vol. 47, No. 3, p. 366, pl. 52, 1928.

garded by Segerstrale to be the mature male of a special form of *P. affinis*, and he suggests that it be designated form *brevicornis*.

Family GAMMARIDAE

Dr. A. Schellenberg has divided the related fresh-water genera of the Gammaridae into two sections, the *Gammarus* section and the *Crangonyx* section. As this family is represented in America by a number of fresh-water genera, I have followed his plan and grouped them under these sections, which may be characterized as follows.

KEY TO THE SECTIONS OF THE GAMMARIDAE

- Antenna 1, accessory flagellum of 3 to 7 joints; gnathopods 1 and 2 subchelate, either very similar or dissimilar, palms when armed bearing only simple spine teeth; urosome segments free and bearing single or groups of dorsal spines; without sternal gills; uropod 3 well developed, inner ramus sometimes greatly reduced; telson cleft to base or nearly so. **Gammarus** section
- Antenna 1, accessory flagellum very small, rudimentary or consisting of one long and one short joint; gnathopods 1 and 2 subchelate, usually very similar and much alike in male and female, palms armed throughout with numerous notched spine teeth (except in gnathopod 1 of *Mctaniphargus*); urosome segments free or coalesced and without groups of dorsal spines; uropod 3 usually reduced and inner ramus, when present, short or scalelike; sternal gills present or absent; telson entire, or slightly or deeply incised
- Crangonyx** section

KEY TO THE GENERA OF THE GAMMARUS SECTION

1. Coxal gills with cylindrical appendages; gnathopod 1 of male larger than gnathopod 2, palm slightly oblique and armed throughout with many blunt, peglike teeth; uropod 3 with inner ramus very small
- Anisogammarus**¹²
- Coxal gills without cylindrical appendages; gnathopod 1 of male smaller than gnathopod 22
2. Gnathopod 1 of male, palm long, very oblique, and armed with only one or two spine teeth in addition to those at palmar angle.....**Gammarus**¹³
- Gnathopod 1 of male, palm short, slightly oblique and without true spine teeth**Weckelia**

The genus *Anisogammarus* is confined to the Pacific coasts of Asia and North America, the only American fresh-water species so far described being *A. ramellus* (Weckel),¹⁴ recorded from California and Oregon.

¹² Derjavin, A. N., The Gammaridae of the Kamchatka Expedition, 1908-1909. Russ. Hydrobiol. Zeitschr., vol. 6, Nos. 1-2, p. 8, 1927.

¹³ Fabricius, J. C., Syst. Ent., p. 418, 1775.

¹⁴ Weckel, Ada L., Proc. U. S. Nat. Mus., vol. 32, No. 1507, p. 38, 1907.

The genus *Gammarus* is widely distributed over North America and is represented by a number of species, but it does not occur in the West Indies or in South America.

The genus *Weckelia* has been found only in Cuba and it is represented by the single species *Weckelia caeca* (Weckel).

KEY TO THE GENERA OF THE CRANGONYX SECTION

1. Urosome segments coalesced.....2
Urosome segments not coalesced.....4
2. Sixth and seventh mesosome segments bearing bifurcate lateral sternal gills
Synpleonia¹⁵
Sixth and seventh mesosome segments bearing simple lateral sternal gills...3
3. Telson entire**Stygonectes**¹⁶
Telson cleft**Synurella**¹⁷
4. Uropod 3, peduncle without rami.....**Apocrangonyx**¹⁸
Uropod 3, peduncle with rami.....5
5. Uropod 3, peduncle with one 1-jointed ramus.....**Stygbromus**
Uropod 3, peduncle with two rami, inner ramus short or scalelike.....6
6. Uropod 3, outer ramus 2- or several-jointed.....7
Uropod 3, outer ramus 1-jointed.....8
7. Coxal gill of gnathopod 2 with cylindrical appendage; palm of gnathopod 1 oblique and not short; inner ramus of uropod 3 very short..**Allocrangonyx**¹⁹
Coxal gill of gnathopod 2 without cylindrical appendage; palm of gnathopod 1 slightly oblique and very short; inner ramus of uropod 3 nearly half the length of first joint of outer ramus.....**Metaniphargus**²⁰
8. Lateral sternal gills of sixth mesosome segment bifurcate; accessory flagellum of antenna 1 rudimentary.....**Falklandella**²¹
Lateral sternal gills of sixth mesosome segment simple; accessory flagellum of antenna 1 2-jointed.....9
9. Uropod 3, outer ramus longer than peduncle; first four coxal plates deeper than their segments; lower posterior corners of the second and third metasome segments right-angled or sharply produced.....**Crangonyx**²²
Uropod 3, outer ramus as long as, or shorter than, peduncle; first four coxal plates shallower than their segments; lower posterior corners of second and third metasome segments broadly rounding.....**Bactrurus**²³

With the exception of the genus *Falklandella*, which was described by Dr. A. Schellenberg from the Falkland Islands off the southeast

¹⁵ Creaser, E. P., Occ. Pap. Mus. Zool., Univ. Michigan, p. 1, 1934.

¹⁶ Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 430, 1902.

¹⁷ Wrzesniewski, A., in Hoyer, Zeitschr. Wiss. Zool., Leipzig, vol. 28, p. 403, 1877.

¹⁸ Stebbing, T. R. R., Trans. Linn. Soc. London, ser. 2, vol. 7, p. 422, 1899.

¹⁹ Schellenberg, A., Mitt. Zool. Mus., Berlin, vol. 22, No. 1, p. 33, 1936.

²⁰ Stephensen, K., Zool. Jahrb., vol. 64, Nos. 3/5, p. 426, 1933.

²¹ Schellenberg, A., Zool. Anz., vol. 91, Nos. 1/4, p. 82, figs. 1 and 7, 1930.

²² Bate, Spence, Proc. Dublin Univ. Zool. Bot. Assoc., vol. 1, p. 237, 1859.

²³ Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 430, 1902.

coast of South America, and the genus *Mctaniphargus* described by Dr. K. Stephensen from the island of Curaçao and now recorded from the island of St. Croix, all the genera of the *Crangonyx* section are confined to North America, but the genus *Crangonyx* occurs also in Europe, and the genus *Synurella* occurs also in Europe and Asia.

STYGOBROMUS Cope, 1872

The genus *Stygobromus* was described by E. D. Cope in 1872 from specimens taken in Mammoth Cave, Ky., but his descriptions of the genus and the genotype, *S. vitreus*, were so unintelligible that subsequent students were not able to recognize the animal until S. I. Smith, in 1888, redescribed the species from specimens procured from the type locality, placing it, however, in the genus *Crangonyx*. Smith believed that *Stygobromus* was a synonym of *Crangonyx*, as Bate had erroneously described the third uropods of *Crangonyx* as uniramous.

In 1873 A. S. Packard²⁴ examined specimens from three wells in Orleans, Ind., and identified them as *Crangonyx vitreus*. S. I. Smith in 1875 examined Packard's specimens from the wells in Orleans and found them to be very different from Mammoth Cave specimens, stating that they were closely allied to *Crangonyx gracilis* from Lake Superior.

Dr. W. P. Hay, in 1897, in speaking of the Crustacea of the caves of Indiana, said that *Crangonyx vitreus* was represented in the collection by nearly a dozen small specimens which were taken from a wooden trough in Salt Petre Cave, Crawford County. In 1902²⁵ Hay said, "This species [*Crangonyx vitreus*] was observed in considerable numbers in Mammoth Cave, both in its type locality, Richardson's Spring, and in the Roaring River district in small pools."

Ada L. Weckel in 1907 gave a short description and figures of *Crangonyx vitreus*, which were made from specimens that were sent to her from the United States National Museum under the name *Crangonyx vitreus* Packard. In 1905 Prof. S. J. Holmes figured *Crangonyx vitreus* from specimens which were sent to him from the United States National Museum, but the specimens were evidently incorrectly identified, as his figures do not represent that species.

In 1913 Prof. A. S. Pearse recorded *Crangonyx vitreus* from a creek 80 miles north of Rampart House, Alaska. As this locality was

²⁴ Packard, A. S., 5th Ann. Rep. Peabody Acad. Sci., p. 95, 1873.

²⁵ Hay, W. P., Proc. U. S. Nat. Mus., vol. 25, No. 1285, p. 225, 1902.

so much farther north than any previous record and as the specimens were from a creek, I wished to examine them, but they could not be located at the museum of the University of Michigan. In 1917 Professor Pearse reported the species from a well at Randolph, Wis.

Dr. A. Schellenberg in 1936 recognized *Stygobromus*, giving a short characterization of the genus, and including in it the species *S. vitreus* Cope, *S. bifurcus* (Hay) and *S. putcalis* (Holmes).

I have examined specimens of *Stygobromus* from Richardson's Spring, Mammoth Cave, Ky., and the characters of the genus may be given as follows: Blind. Antenna 1 longer than antenna 2. Accessory flagellum of antenna 1 2-jointed. Gnathopods 1 and 2 subchelate, 2 stronger than 1. Coxal plate 4 somewhat excavate behind. Second joints of pereopods 3 to 5 moderately expanded. Mandible, molar well developed; cutting edge toothed; accessory plate well developed; three spines in spine row; palp short and stout, second and third joints subequal in length. Maxilla 1, inner plate bearing a few plumose setae; outer plate armed with seven serrate spine teeth; palp 2-jointed and bearing apical spines and setae. Maxilla 2, inner plate wider than outer and bearing an oblique row of plumose setae. Maxillipeds with inner and outer plates well developed; inner plate as long as, or longer than, outer and bearing two serrate spine teeth; outer plate without marginal teeth; palp 4-jointed, short and stout. Lower lip with mere suggestion of inner lobes; lateral lobes large and bluntly rounding. Simple stalked coxal gills and simple sternal gills present. Uropod 3 uniramous, ramus 1-jointed and shorter than peduncle. Telson short, about as long as wide, and distally slightly excavate or entire.

STYGOBROMUS VITREUS Cope

FIGURES 1, 2

Stygobromus vitreus COPE, 1872, Amer. Nat., vol. 6, p. 422.

Crangonyx vitreus SMITH, 1874, Rep. U. S. Fish Comm., 1872-73 [1874], p. 656.

Crangonyx vitreus SMITH, 1875, Amer. Journ. Sci. and Arts, ser. 3, vol. 9, p. 476.

Crangonyx vitreus SMITH, 1888, Mem. Nat. Acad. Sci., vol. 4, pt. 1, p. 34, pl. 5, figs. 1-4.

Crangonyx vitreus HAY, 1897, Indiana Dep. Geol. and Nat. Res., 21st Ann. Rep., p. 206.

Crangonyx vitreus HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, No. 1285, p. 225.

Crangonyx vitreus HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, No. 1292, p. 429.

Crangonyx vitreus WECKEL, 1907, Proc. U. S. Nat. Mus., vol. 32, No. 1507, p. 49, fig. 13.

Crangonyx vitreus BANTA, 1907, The Fauna of Mayfields Cave, Ind., p. 80.

Crangonyx vitreus PEARSE, 1913, Occ. Pap. Mus. Zool., Univ. Michigan, No. 1, p. 3.

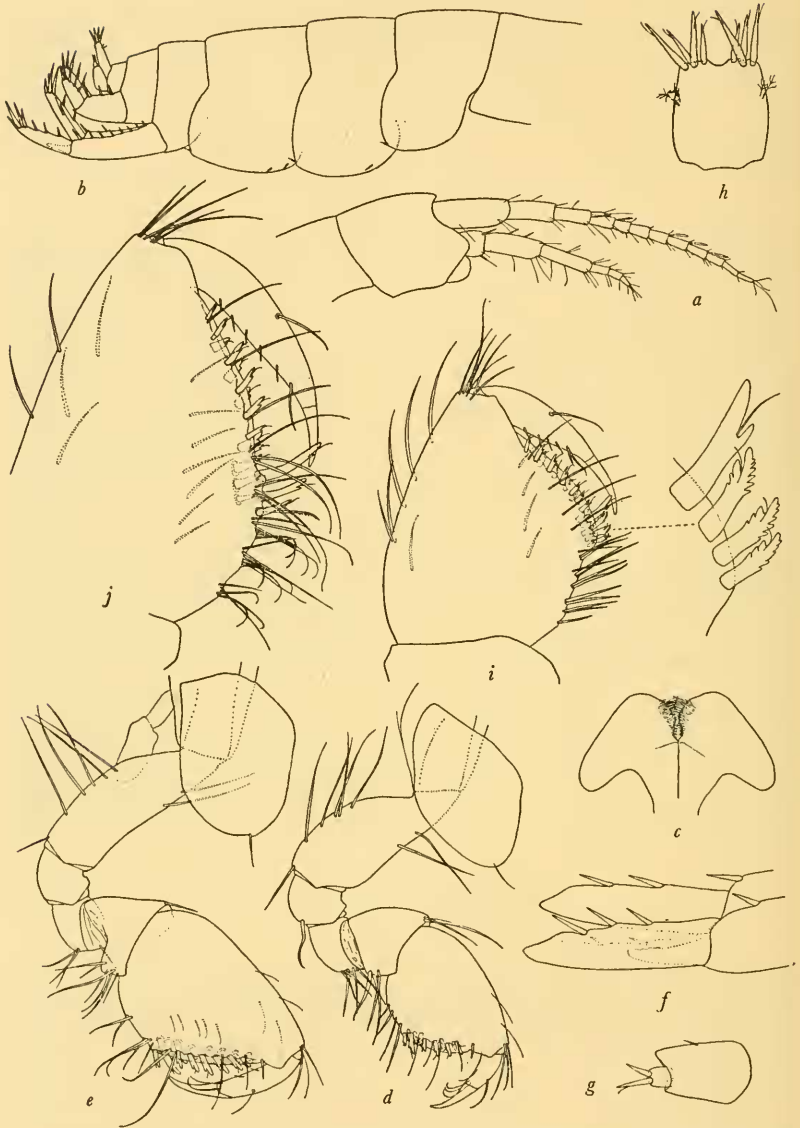


FIG. 1.—*Stygobromus vitreus* Cope. Male from Richardson's Spring, Mammoth Cave, Ky.: *a*, head and antennae; *b*, hind end of animal; *c*, lower lip; *d*, gnathopod 1; *e*, gnathopod 2; *f*, uropod 1; *g*, uropod 3; *h*, telson. Female from Buzzards Cave, Crystal Cave, Mammoth Cave, Ky.: *i*, gnathopod 1; *j*, gnathopod 2.

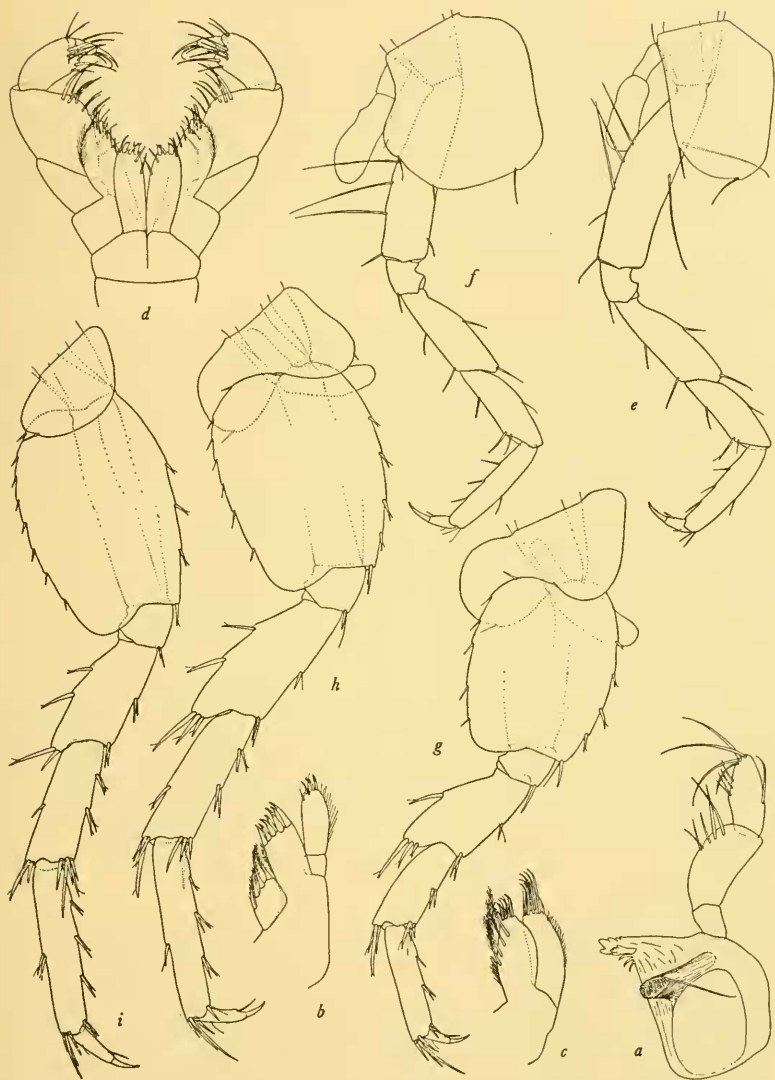


FIG. 2.—*Stygobromus vitreus* Cope. Male from Richardson's Spring: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxillipeds; *e*, peraeopod 1; *f*, peraeopod 2; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5.

Crangonyx vitreus PEARSE, 1917, Occ. Pap. Mus. Zool., Univ. Michigan, No. 46, p. 8.

Stygobromus vitreus SCHELLENBERG, 1936, Mitt. Zool. Mus., vol. 22, No. 1, p. 37.

Male.—Head rather long; side lobe angularly produced and with narrowly rounding apex; without eyes. Antenna 1, peduncular joints successively shorter; flagellum very little longer than peduncle and composed of about nine joints, some of which carry slender sensory clubs; accessory flagellum shorter than first joint of primary flagellum and composed of two joints. Antenna 2 about half the length of antenna 1; fifth peduncular joint very little shorter than fourth; flagellum about as long as fifth peduncular joint and composed of about four joints.

Right mandible short, with about five teeth on cutting edge; accessory plate with 3-pronged cutting edge; three spines in spine row; molar rather prominent and bearing seta at inner corner; palp short and stout, second joint very little longer than third. Maxilla 1, inner plate with four plumose setae on the obliquely truncate distal margin; outer plate with seven serrate spine teeth; palp with four slender spines and one seta on distal edge, and fine setules on outer margin. Maxilla 2, inner plate wider, but slightly shorter than outer and bearing an oblique row of four plumose setae near inner margin; outer plate with the usual distal spines, and with fine setules on outer margin. Maxillipeds short and stout, inner plate narrower but a little longer than outer, armed distally with two serrate teeth and a few short spines; outer plate with inner distal angle slightly produced, inner margin without teeth but bearing a submarginal row of about seven spines; palp short and stout and bearing rather few spines, outer margin of third joint equal in length to outer margin of second, fourth joint bearing a long slender nail at the base of which are two spinules. Lower lip without inner lobes, side lobes large and broadly rounding distally.

Gnathopod 1 shorter than, and not as stout as, gnathopod 2, second joint a little longer than the sixth; fifth joint about half the length of sixth; sixth joint about a third longer than wide with front and hind margins slightly convex, palm oblique, slightly convex, about as long as hind margin of joint, defined by an evenly rounding curve, and armed on outside and inside margins with a few notched spine teeth; seventh joint fitting palm and bearing a long nail and several setae. Gnathopod 2, second joint about as long as sixth joint; fifth joint less than half the length of sixth; sixth joint, palm oblique, slightly convex, slightly longer than hind margin of joint, defined by a blunt angle, and armed on outside and inside margins with eight

notched spine teeth; seventh joint fitting palm and bearing a long nail and several setae.

Peraeopods 1 and 2 equal in length and bearing very few spines, which are placed singly and not in groups; nail of seventh joint very long. Peraeopod 3 about as long as 2; second joint almost as wide as long, lower hind lobe dipping very slightly; remaining joints rather short and stout; seventh joint short with prominent nail. Peraeopods 4 and 5 about equal in length and longer than 3; second joint considerably expanded with lower hind lobe dipping very little; seventh joint proportionately longer than in peraeopod 3.

Uropod 1 extending farther back than 2, peduncle produced distally below into a long narrow process, rami subequal in length and much shorter than peduncle. Uropod 2, peduncle armed above with three spines, outer ramus shorter than inner which is very little shorter than peduncle. Uropod 3 scarcely reaching end of telson, ramus about one-quarter as long as peduncle and armed distally with two spines. Telson nearly as wide as long, distal margin with a very shallow central excavation; each lobe armed with four spines, and either lateral margin bearing two plumose setules. Length, about 4 mm. Mesosome segments 2, 3, and 4 each bearing a single, cylindrical, median sternal gill. Mesosome segments 6 and 7 each bearing a pair of lateral sternal gills. Mesosome segment 7 is without coxal gills. The gill arrangement of the two sexes is alike.

Female.—Palm of gnathopod 1 bears at the rounding defining angle a long stout spine beyond which are three shorter spines which are both notched and serrate. Palm of gnathopod 2 bears at the defining angle a long stout spine, beyond which are two shorter spines which are notched only.

WECKELIA, new genus

In 1907 Ada L. Weckel described the species *Gammarus caecus* from Modesta Cave, near Cañas, Cuba. Her description is very incomplete and she figures only the antennae and gnathopods. As Dr. A. Schellenberg has already remarked, the species could not possibly belong to the genus *Gammarus* from the character of the first gnathopods alone. I have examined the original fragmentary specimens and have formed a new genus for the reception of the species, which I here designate as *Weckelia* in honor of Miss Weckel, who most usefully, in 1907, brought together in one publication all the genera and species of fresh-water amphipods known at that time in North America.

The genus *Weckelia* may be characterized as follows: Without eyes. First antenna longer than second, with flagellum much longer than peduncle. Accessory flagellum of several joints. Second antenna with flagellum shorter than peduncle; gland cone prominent. Mandible with molar well developed; accessory plate present; several spines in spine row; palp reduced to one small joint. First maxilla, inner plate broad, bearing 12 or 13 plumose setae; outer plate bearing 9 spine teeth; palp 2-jointed. Second maxilla, inner plate a little wider than outer and bearing an oblique row of plumose setae. Maxilliped, inner plate armed distally with three spine teeth; outer plate bearing a row of spine teeth on inner margin; palp 4-jointed. Lower lips with inner lobes very small and indistinct; lateral lobes prominent. First gnathopod, in female, with fifth joint longer and wider than sixth; sixth joint narrow, with palm short and slightly oblique. Second gnathopod in female larger than first; fifth joint shorter, but wider than sixth; sixth joint narrowing distally and with palm very oblique. Coxal plates 1 to 4 much deeper than their segments, fourth excavate behind. Pleopods well developed. Urosome segments free, second segment bearing a single dorsolateral spinule on either side. Third uropods missing. Telson cleft to base, with lobes widely dehiscent. Gills simple. No sternal gills discernible.

Genotype.—*Gammarus caecus* Weckel.

WECKELIA CAECA (Weckel)

FIGURES 3, 4

Gammarus caecus WECKEL, 1907, Proc. U. S. Nat. Mus., vol. 32, p. 47, fig. 12.

Female.—Head, lateral lobes rather small with evenly rounding lower corner. Antenna 1, second joint longer than first; third joint over one-third the length of second, flagellum composed (according to Weckel) of 20 to 30 joints; accessory flagellum 4-jointed, the last joint very small. Antenna 2 (according to Weckel) about two-thirds the length of antenna 1; fifth joint a little shorter than fourth; flagellum of about 13 joints. Mandible, molar well developed with a plumose seta on right but not on left molar; cutting edge toothed; accessory plate simple with toothed cutting edge; five spines in spine row; palp very small and consisting of only a single joint bearing apically two setae. Maxilla 1, inner plate very well developed, with the oblique edge bearing 12 or 13 plumose setae and a row of simple spinules; outer plate armed with 9 spine teeth; palp, second joint bearing distally an oblique row of about 8 short spines submarginal to which is an oblique row of 5 slender spinules. Maxilla 2, inner

plate with diagonal row of closely set plumose setae which curves inward considerably at the distal end. Maxillipeds, inner plate about as long as outer plate, bearing three spine teeth on distal margin and (in the specimen figured) two smaller teeth on the upper inner margin; outer plate armed with about five to seven spine teeth on inner margin; palp, fourth joint curved, bearing fine setules on inner edge and a short nail apically.

Gnathopod 1, coxal plate with side margins nearly parallel, lower corners evenly rounding and hind corner bearing two short spines; fifth joint longer and wider than sixth, expanded distally with the lower margin bearing a group of spines and a brush of very fine setules; sixth joint about twice as long as wide, slightly expanded distally, and bearing a few groups of spines; palm slightly oblique, convex, bearing a row of four submarginal spines on outside and five on inside; seventh joint curved and fitting palm. Gnathopod 2, coxal plate slightly expanded distally, lower margin evenly convex with the rounding hind corner bearing two or three short spines; fifth joint more expanded proportionately than that of gnathopod 1, but similarly armed; sixth joint widest proximally, palm very oblique with a slight concavity toward the long defining spine, bearing five or six submarginal spines on the outside, and merging imperceptibly into the convex hind margin of joint; hind margin bearing two groups of spines; seventh joint strong, slightly curved, and as long as palm.

Peraeopods 1 and 2 slender and much alike, seventh joint slightly curved and bearing a seta at the base of the nail. Peraeopods 3 to 5 much alike, second joint considerably expanded, front margin bearing short spines and the hind margin serrate with a seta at each serration; lower portion of all peraeopods missing. Coxal plate 3, lower margin convex and bearing two short spines at the rounding hind corner. Coxal plate 4, lower margin convex and bearing a few setules but no spines. Coxal plate 5 with hind lobe the deeper.

Metasome segment 1 with lower margin produced into two small teeth; segments 2 and 3 with lower hind angle scarcely at all produced, lower margins bearing one or two spinules, and hind margin bearing a single setule just above the lower angle. Pleopods all well developed. Urosome segment 2, hind margin with a subdorsal spine on either side. Uropod 1 bearing a prominent spine on lower margin of peduncle near the base; rami imperfect. Uropod 2, outer ramus equal in length to peduncle, inner ramus longer than outer. Weckel says that in uropods 1 and 2 the rami are about equal in length, but this apparently is not correct. Uropod 3 missing. Telson is about twice as wide as long, cleft to base with lobes very widely separated,

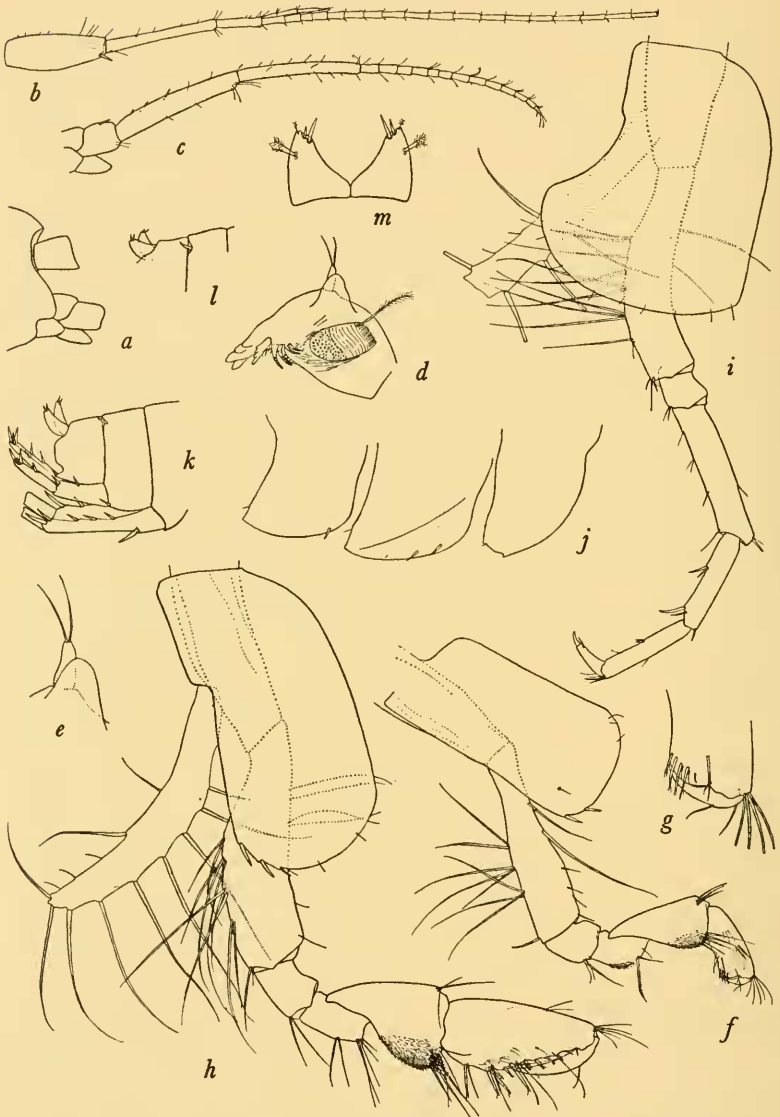


FIG. 3.—*Weckelia cacca* (Weckel). Female: *a*, front of head; *b*, antenna 1; *c*, antenna 2; *d*, mandible; *e*, mandibular palp; *f*, gnathopod 1; *g*, end of sixth joint of gnathopod 1 greatly enlarged; *h*, gnathopod 2; *i*, pereopod 2; *j*, metasome segments; *k*, urosome and uropods 1 and 2; *l*, urosome segments 2 and 3 showing one of the dorsolateral spines; *m*, telson.

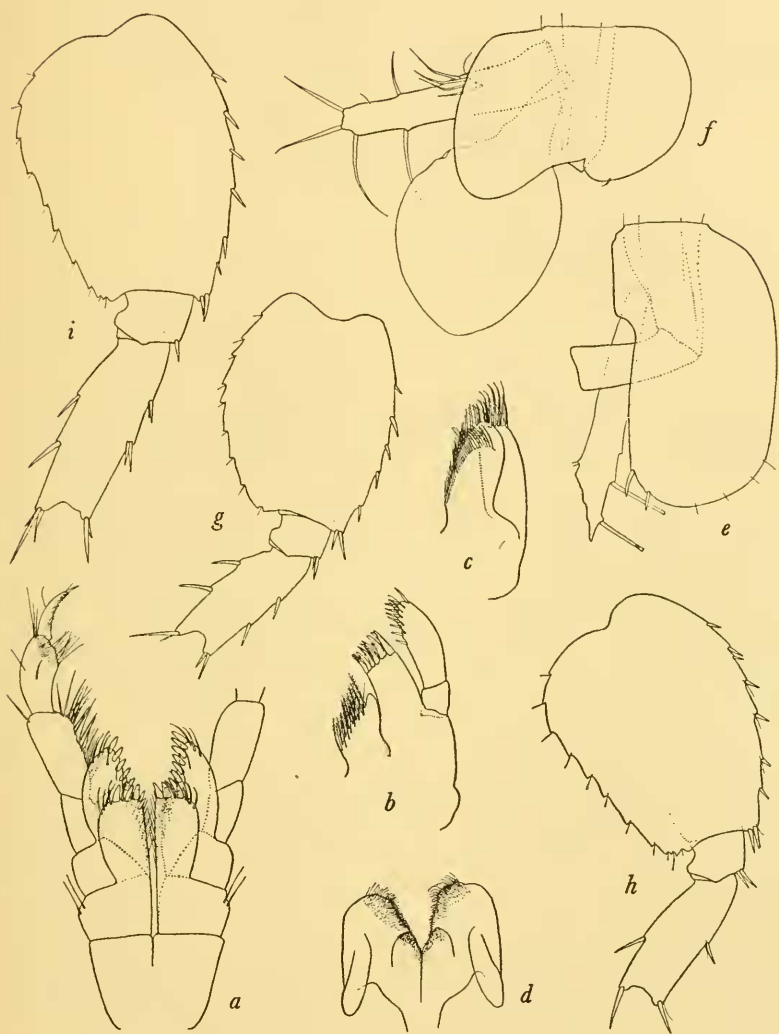


FIG. 4.—*Weckelia caeca* (Weckel). Female: *a*, maxillipeds; *b*, maxilla 1; *c*, maxilla 2; *d*, lower lip; *e*, coxal plate 3; *f*, coxal plate 5; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5.

each lobe armed apically with two short spines and a plumose setule, and the lateral margins each bearing two plumose setules near the distal end. Length of female about 10 mm.

Remarks.—The specimen that I have figured and described is a female. Miss Weckel's figures and description are said to be of a male, and if this is correct the sexes are apparently alike.

CRANGONYX ANTENNATUS Packard

FIGURES 5, 6

Crangonyx antennatus PACKARD 1881, Amer. Nat., vol. 15, p. 880, fig. 2; 1888, Mem. Nat. Acad., vol. 4, p. 36, figs.

Eucrangonyx antennatus STEBBING 1899, Trans. Linn. Soc. London, ser. 2, vol. 7, p. 423.

Niphargus antennatus W. P. HAY, 1902, Proc. U. S. Nat. Mus., vol. 25, p. 430, figs. 6 and 11; Weckel 1907, Proc. U. S. Nat. Mus., vol. 32, p. 36, fig. 6.

Professor Packard described this species from Nickajack Cave, Tenn., but, as was so often the case with early descriptions and figures, his description was not accurate enough for the recognition of the species. Dr. W. P. Hay in 1902 redescribed and figured the species from specimens which he took at various places in Nickajack Cave, and, believing that the outer ramus of the third uropods possessed a small second joint, placed the species in the genus *Niphargus*. Ada L. Weckel in 1907 redescribed and figured the species, but added nothing of importance. She followed Hay in figuring and describing the outer ramus of the third uropod as consisting of two joints, and retained the species in the genus *Niphargus*.

Recently I examined specimens of this species which were taken by Dr. Hay in Nickajack Cave and find that it is a *Crangonyx*, as it agrees with this genus in all characters. The outer ramus of the third uropod is considerably constricted at the last group of lateral spines which gives somewhat the appearance of forming a short second joint.

Packard gives the length of the species as 6 to 7 mm. Hay does not give the length of his specimens. Weckel, who presumably used specimens collected by Hay for study, gives the length as 10 mm. The largest specimens which I measured were about 8.5 mm.

Female.—Head rather long with prominent side lobes which have evenly rounding corners. No eyes were discernible in the specimens examined, but Packard and Hay figure very small, slightly pigmented eyes. Antenna 1 long; first joint of peduncle slightly shorter than the second, which is twice the length of the third. Antenna 2 short;

fourth joint slightly longer than fifth; flagellum about the length of the fifth peduncular joint and composed of eight joints.

Mandible with molar rather prominent; accessory plate with double serrate edge; eight spines in spine rows; palp with second and third joints about equal in length. Maxilla 1, inner plate with seven plumose setae; outer plate with seven serrate spine teeth; palp armed distally with six spines and several setae. Maxilla 2, inner plate wider than, but equal in length to, outer plate and bearing an oblique row of eight submarginal plumose setae. Maxilliped, inner plate a little longer than outer and armed distally with two teeth and a few setae; outer plate reaching to about the first third of the second joint of palp, bearing only short slender spines on inner margin and a few longer spines distally; palp rather short and stout; fourth joint slender and bearing a prominent nail. Lower lip with slight indications of inner lobes; side lobes very prominent. Coxal plates 2 to 4 are perhaps slightly deeper than their segments and broadly rounding below. Coxal plate 4 deeper than long. Packard speaks of the fourth plate being large and square, but it is no larger than is normal for the genus.

Gnathopod 1, second joint very little longer than the sixth; fifth joint a little over half the length of the sixth and bearing five groups of spines on the broadly rounding lower margin; sixth joint with palm oblique, slightly convex, defined by a stout spine beyond which is a short spine, and slightly longer than hind margin of joint; seventh joint fitting palm and bearing a few setae on inner edge. Gnathopod 2, second joint equal in length to sixth; fifth joint a little over half the length of the sixth and bearing on the broadly rounding lower margin five groups of spines; sixth joint twice as long as wide, palm very oblique, slightly convex, longer than the hind margin of joint and defined by a stout spine; seventh joint fitting palm and bearing a few short setae on the inner edge.

Peraeopods 1 and 2 subequal in length and much alike; seventh joint bearing a prominent nail at the base of which are two setae. Peraeopods 3 to 5 much alike in size and shape; second joint moderately expanded, oval, with lower hind margin forming a shallow lobe.

Metasome segments 1 to 3 with lower hind corner very slightly produced and lower margins bearing a few spinules. Uropod 1 extending back a little farther than 2, and uropod 2 a little farther than 3. Uropod 3, peduncle two-thirds the length of outer ramus; inner ramus bearing a single spine. Telson reaching to about the end of peduncle of uropod 3, cleft for about half its length with lobes widely separated and each lobe bearing three apical spines.

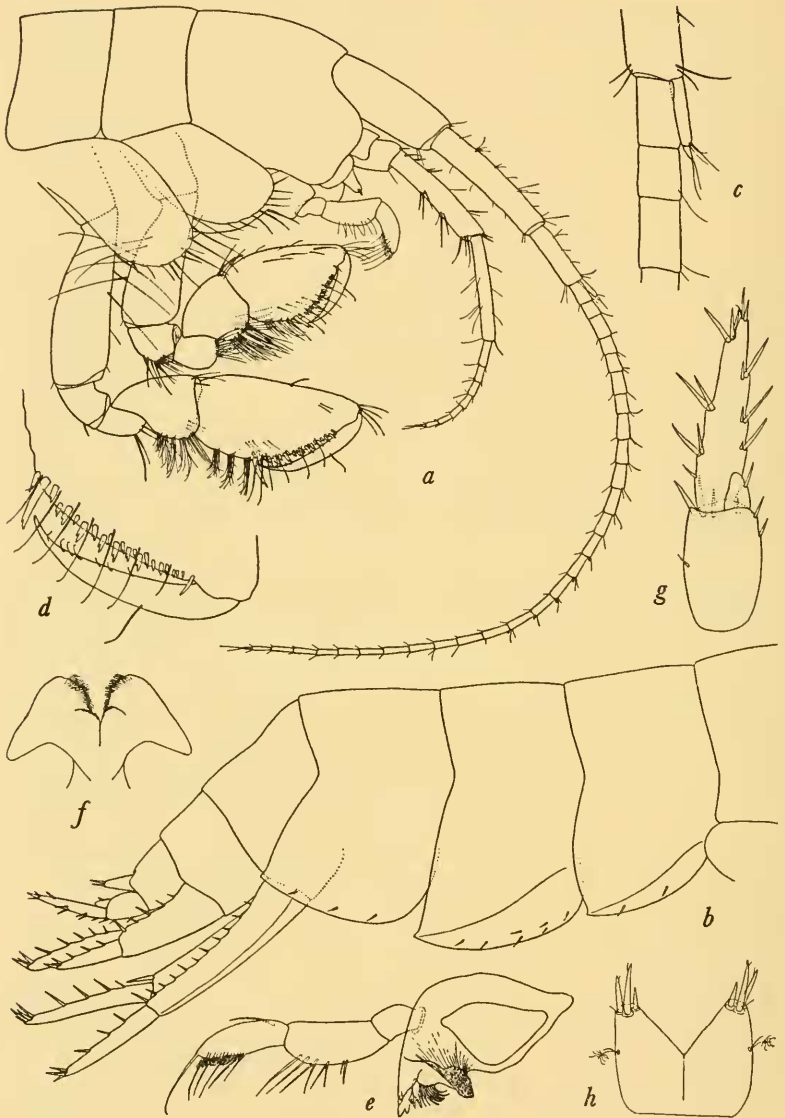


FIG. 5.—*Crangonyx antennatus* Packard. Female: *a*, anterior end of animal; *b*, posterior end of animal; *c*, accessory flagellum greatly enlarged; *d*, palm of gnathopod I greatly enlarged; *e*, mandible; *f*, lower lip; *g*, uropod 3; *h*, telson.

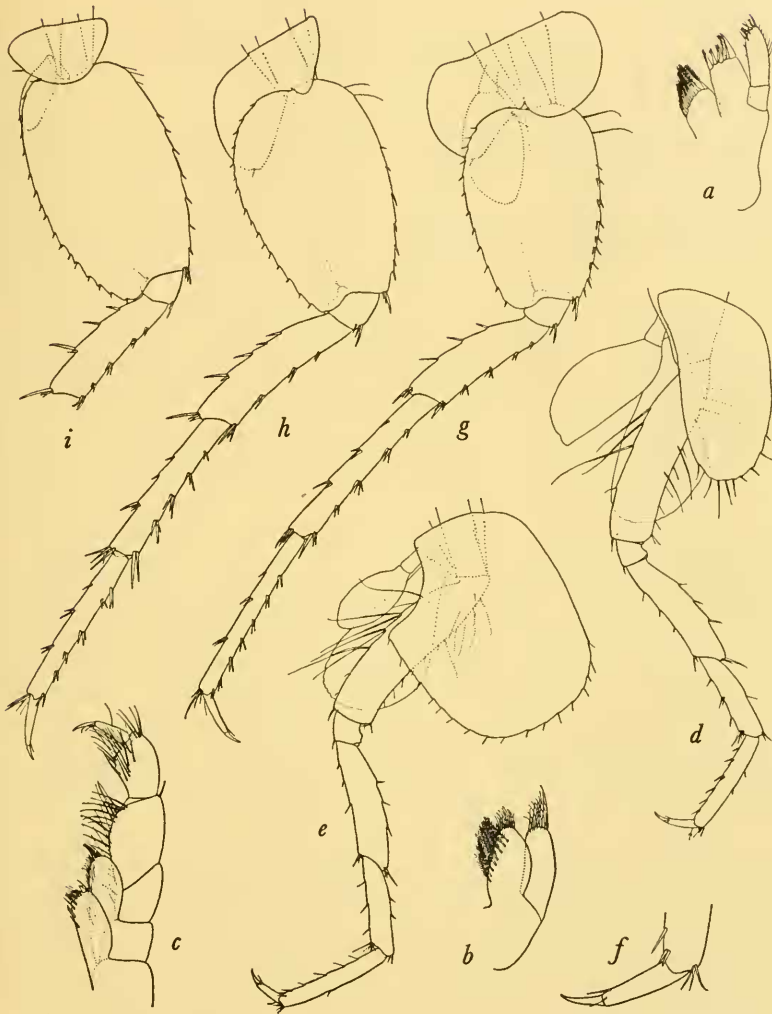


FIG. 6.—*Crangonyx antennatus* Packard. Female: a, maxilla 1; b, maxilla 2; c, maxilliped; d, peraeopod 1; e, peraeopod 2; f, seventh joint of peraeopod 2 greatly enlarged; g, peraeopod 3; h, peraeopod 4; i, peraeopod 5.

Mesosome segments 1 and 2 each bearing a simple, cylindrical, median sternal gill and mesosome segments 6 and 7 and metasome segment 1 each bearing a pair of simple lateral sternal gills. Length of female, from front of head to end of uropod 1, 8.5 mm.

CRANGONYX DEAROLFI, new species

FIGURES 7, 8

Male.—Head with side lobes prominent and rounding. Eye small, indistinct, consisting of only a few elements, and with very little color. Antenna 1 about one-half the length of the body; first and second joints about equal in length, third joint half the length of the second; flagellum much longer than peduncle, and consisting of from 25 to 33 joints, accessory flagellum consisting of 1 long and 1 very short joint. Antenna 2 much shorter than 1, fifth joint a little shorter than the fourth; flagellum short and consisting of from 9 to 12 joints; fourth and fifth joints of peduncle and the joints of the flagellum, except the distal few, bear club-shaped sense organs.

Maxillipeds with inner lobes longer and broader than outer; inner lobes armed distally with four stout spine teeth and three or four setae, two smaller spines at inner distal corner, and three spines on the oblique inner margin; outer lobe with narrowly rounding apex, inner margin armed with five or six spine teeth and marginal setae; palp stout, third joint bearing a short distal lobe, fourth joint bearing a minute nail and a few marginal setules. Maxilla 1 with inner lobe rounding and bearing three or four plumose setae; outer lobe armed with seven spine teeth which are distally serrate; palp armed distally with seven slender spines and a few setae. Maxilla 2, inner lobe broader than outer, and bearing an oblique row of three submarginal plumose setae. Right mandible with 3 or 4 teeth on the cutting edge; accessory plate strongly toothed; 9 or 10 spines in spine row; molar long and concave and bearing fine teeth only on the lower margin; palp with third joint little shorter than second. Lower lip with inner lobes small and rather poorly defined, both inner and outer lobes bearing fine setae but no spine teeth.

Gnathopod 1, palm quite oblique, convex, armed with about 12 notched spine teeth between which are scattered smaller teeth, and defined by a very slight rounding angle. The curve of the defining angle is armed with a row of six short closely set curved marginal spines, and opposite these is a similar row of submarginal bifurcate spines on the inside surface. Some of the smaller marginal spines nearer the hinge of the seventh segment are rather complex, bearing

distally three or four sharp teeth and a seta. The hind margin of the sixth joint bearing several rows of setae, and the front margin several groups of setae. The seventh joint is of the same length and curvature as palm; inside margin bearing very fine setules, and the outer margin bearing longer ones. Gnathopod 2 much stouter than 1, with the very oblique, slightly convex palm nearly twice the length of the hind margin of the joint. Palm armed with about 12 notched spines between which are scattered smaller notched spines; the low, rounding defining angle bearing a long notched spine; 3 stout submarginal spines on inside surface of joint opposite the defining angle. Rear margin of joint bearing several groups of setae and the front margin with a few scattered setae. Seventh joint the length and curvature of palm, armed on inner margin with fine setules and on the outer margin with several longer ones.

Peraeopods 1 and 2 about equal in length and much alike in shape and armature; seventh joint bearing small nail and four setae on inner margin. Peraeopod 4 longer than 3 or 5 which are subequal in length. Hind margin of the second joint of peraeopods 3 and 5 is evenly convex, but that of 4 is nearly straight for the lower two-thirds. The seventh joint of peraeopods 3 to 5 bears four setae on the inner margin.

The first coxal plate is about twice as deep as wide; front margin concave with narrowly rounding lower front angle; lower margin evenly rounding without any posterior angle and sparsely beset with short setae. Second coxal plate longer than the first with lower margin evenly rounding and bearing a few short setae. Third coxal plate very much like the second. These first three coxal plates bear on the lower margin a group of three closely set setae which are about twice the length of the rest. The fourth coxal plate is nearly as wide as deep with short setae throughout the lower and hind margins, but without the group of three longer setae.

The three metasome segments with their lower posterior angles slightly produced, though in the male specimen that I have designated as the type the lower posterior corner of the third segment is rather evenly rounding with only a mere suggestion of the angle, but this undoubtedly is only an individual variation. The lower margins of segments 2 and 3 bear a row of short spines with a few spinules higher up. In the specimen figured the hind margin of segment 1 bears one setule, and that of segment 2 bears two setules, while that of segment 3 bears only one which is placed in a shallow notch.

Uropod 1 extending farther back than 2, and uropod 3 not extending back as far as 2. Uropod 2 possesses the sexual variation which

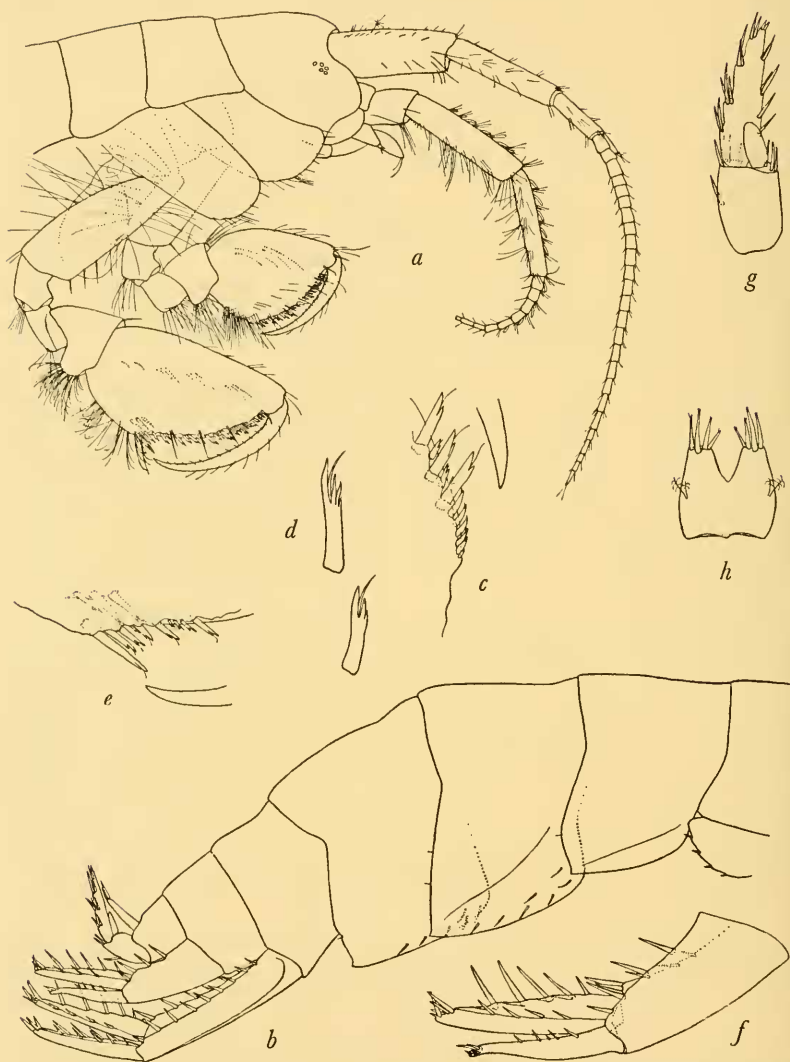


FIG. 7.—*Crangonyx dearolfi*, new species. Male: *a*, anterior end of animal; *b*, posterior end of animal; *c*, part of gnathopod 1 greatly enlarged; *d*, two of the palmar spines greatly enlarged; *e*, part of palm of gnathopod 2 greatly enlarged; *f*, uropod 2; *g*, uropod 3; *h*, telson.

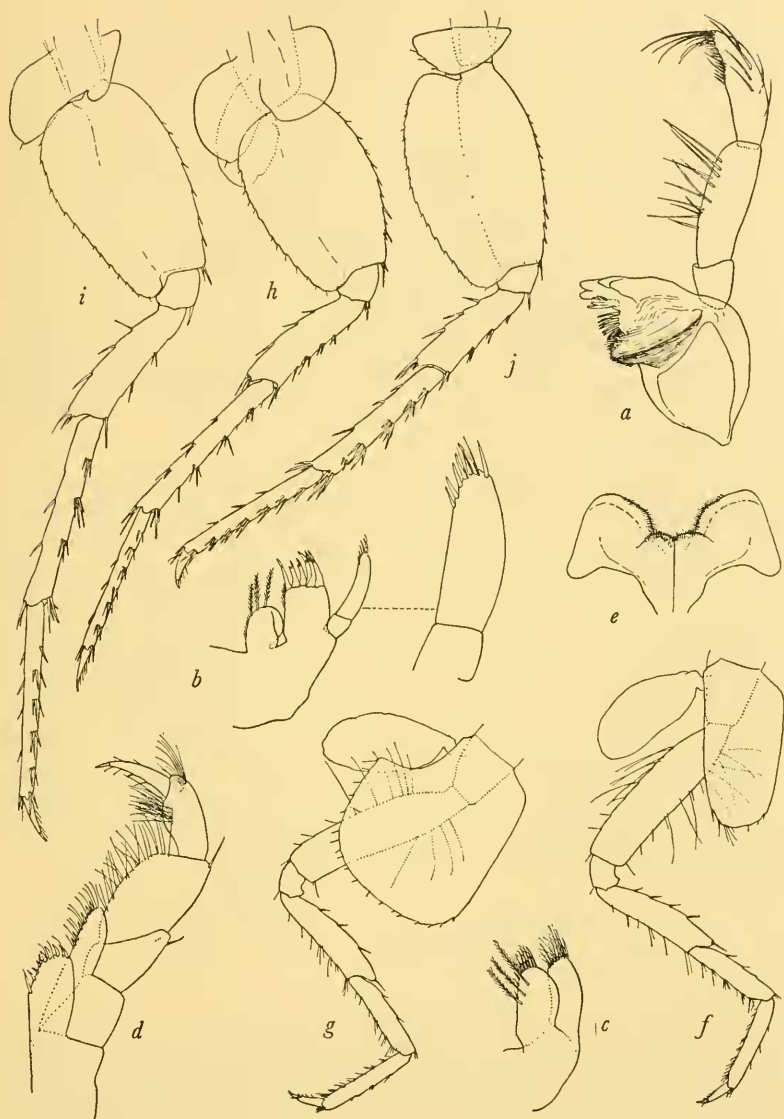


FIG. 8.—*Crangonyx dearolfi*, new species. Male: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxilliped; *e*, lower lip; *f*, pereopod 1; *g*, pereopod 2; *h*, pereopod 3; *i*, pereopod 4; *j*, pereopod 5.

is usual in the genus *Crangonyx*. The outer ramus which is shorter and weaker than the inner ends in a narrowly rounding lobe which has a tendency to bend downward. The peduncle, which is equal in length to the inner ramus, bears four stout spines on outer margin, and five on the inner margin, the three at the distal corner being placed together. The outer ramus is armed on the outer edge with four slender spines, on the inner edge with two or three short spinules, and at the apex with a group of two long and three short spines. The inner ramus is armed on the inner margin with five stout spines, on the outer margin with four slender spines and distally with the normal group of spines. Uropod 3, peduncle about two-thirds the length of the outer ramus, which bears three groups of spines on the outer margin, four on the inner margin, and two short spines apically; inner ramus about one-third the length of the outer and without spines.

Telson reaching to about the middle of the inner ramus of uropod 3, as wide as long, cleft almost to center, a group of two plumose setae on lateral margins, and the lobes armed distally with four stout spines.

The second and third mesosome segments each bearing a single median cylindrical sternal gill. The sixth and seventh mesosome segments with the usual simple saclike lateral sternal gills and the first metasome segment with a pair of lateral sternal gills. The coxal gills of the last pair of pereopods are not attached to the inside surface of the coxae, as is normally the case, but arise from the inside surface of the second joint near the upper margin. Length, male, 15 or 16 mm.

Type.—A male from Hobo Cave, Wernersville, Berks County, Pa., July 28, 1938, collected by Kenneth Dearolf, U.S.N.M. No. 78266.

Length of largest female from Hobo Cave, 22 mm.

METANIPHARGUS BEATTYI, new species

FIGURE 9

In 1933 Dr. K. Stephensen (Zool. Jahrb., vol. 64, Nos. 3/5, p. 426, 1933) established the genus *Metaniphargus* from specimens which had been found "in a small pond, lately covered, at the well, at the border of the calcareous area" at Bak Ariba (Hato), Curaçao, in June 1931. It was of great interest to me, upon examining specimens taken from a well at Frederiksted, St. Croix, Virgin Islands, in 1937 by Mr. H. A. Beatty, to find that they belonged to the same genus as the specimens from Curaçao. Upon dissection and study, they proved, however, to represent a new species, which I now designate *Metaniphargus beattyi* in honor of Harry A. Beatty, an ardent collector who

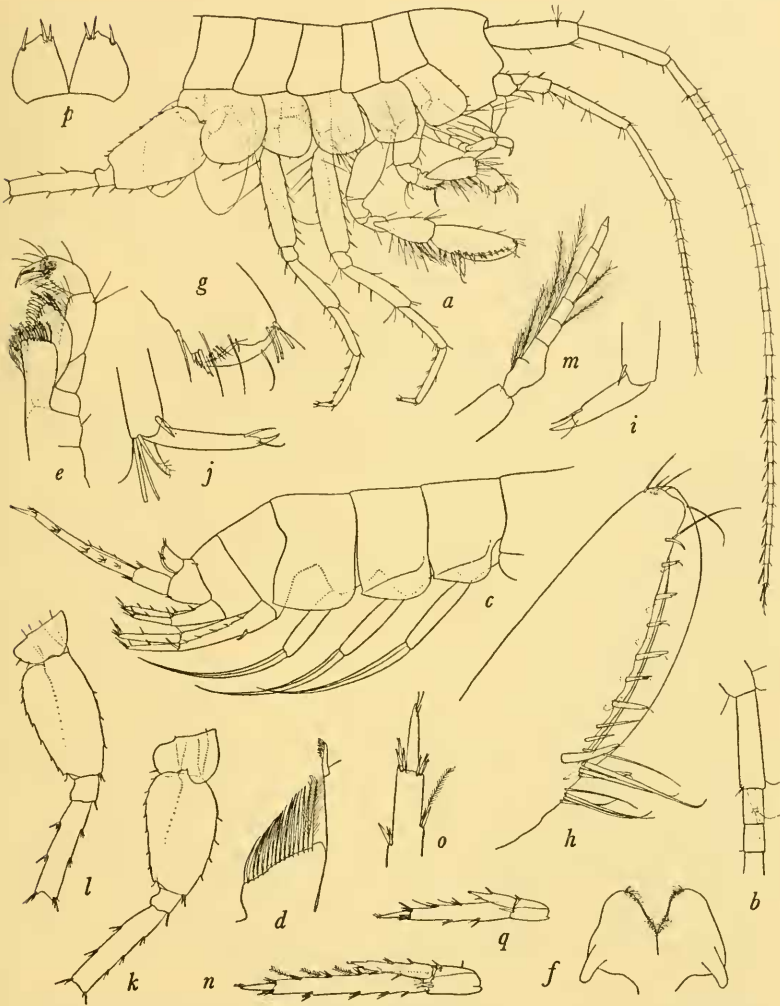


FIG. 9.—*Metaniphargus beattyi*, new species. Male: *a*, anterior end of animal; *b*, accessory flagellum greatly enlarged; *c*, posterior end of animal; *d*, inner plate of maxilla 1; *e*, maxilliped; *f*, lower lip; *g*, distal end of gnathopod 1 greatly enlarged; *h*, distal end of gnathopod 2 greatly enlarged; *i*, seventh joint of peraeopod 2 greatly enlarged; *j*, distal end of peraeopod 3 greatly enlarged; *k*, peraeopod 4; *l*, peraeopod 5; *m*, pleopod 3; *n*, uropod 3; *o*, end of outer ramus of uropod 3; *p*, telson. Female: *q*, uropod 3.

has given many fine specimens of Crustacea to the United States National Museum.

Male.—Head, lateral lobes rather shallow and rounding; eyes absent. Antenna 1 nearly as long as body, first joint about equal in length to the second which is over twice as long as third; flagellum about twice as long as peduncle, and composed of about 26 joints, the distal third of which bear club-shaped sense organs; accessory flagellum composed of 1 long and 1 very short terminal joint, and not as long as the first joint of primary flagellum. Antenna 2 perhaps a little over half the length of antenna 1, fourth and fifth joints about equal in length, flagellum shorter than the peduncle and composed of about 11 joints which are without sense organs.

Right mandible as figured by Stephensen for *M. curasavicus*. Left mandible, first spine of spine row with distal end expanded, the following spines curved and plumose; molar without seta. Maxilla 1, inner plate broad and bearing 15 plumose setae; Dr. Stephensen says that in *M. curasavicus* the inner plate is narrow with 3 apical setae, which is very different from the present species. Maxilla 2 as figured by Stephensen for *M. curasavicus*. Maxilliped, inner plate a little shorter than outer and armed on distal margin with two spine teeth and a row of plumose spines; outer plate reaching nearly to the end of the second palp joint, and armed on the upper inner margin with a row of closely set spine teeth; third joint of palp nearly as long as second; fourth joint bearing nail and a row of very fine setules.

Gnathopod 1, fourth joint armed on the hind margin with a long, curved serrate spine; fifth joint longer but very little wider than sixth; sixth joint not quite twice as long as wide, palm transverse, slightly convex and very finely dentate, passing into the hind margin of joint by an evenly rounding curve which bears three notched spines; seventh joint as long as palm, but not fitting against it closely. Gnathopod 2 considerably stronger than 1, fifth joint shorter but about as wide as sixth; sixth joint long and oval, palm very oblique and passing gradually into the hind margin of joint, defined by two stout spines and a group of long slender spines, armed on outside margin with about seven notched spines and on the inside margin with five or six; seventh joint as long as the palm and fitting snugly against it when closed.

Peraeopods 1 and 2 slender and alike in size and structure; seventh joints straight and bearing two setae at the base of the short nail. Peraeopod 3 with second joint only moderately expanded as in *M. curasavicus*; seventh joint slender, very slightly curved, and bearing two setae at the base of the short nail. Peraeopods 4 and 5

have the fifth to seventh joints missing in all specimens, but the second, third, and fourth joints resemble those of pereopod 3. Coxal plates 1 to 5 about as deep as their segments, fourth not excavate behind; fifth as deep as fourth and with front lobe much deeper than hind lobe.

Metasome segments each with lower hind corner minutely produced. Uropod 1 reaching back slightly farther than 2, peduncle longer than rami and bearing a stout spine on lower margin about a third the distance from the base; outer ramus shorter than inner. Uropod 2, peduncle slightly longer than inner ramus which is longer than the outer ramus. Uropod 3 longer than 1 and reaching back much farther, peduncle about one-third as long as the first joint of outer ramus; outer ramus twice as long as inner, first joint bearing groups of marginal spines, and those of the inner margin each bearing a plumose seta; second joint about one-fourth the length of the first and bearing apically three minute setules; inner ramus slender and bearing marginal spines. Pleopods well developed. Pleopod 3, outer ramus with a low lobe or swelling on inner margin near the base. The gills are simple, large, and oval and attached to the coxal joints of gnathopod 2 and pereopods 1 to 4 by a well-developed stalk as in *M. curasavicus*. No sternal gills are present. Telson nearly twice as wide as long, cleft to base with each lobe bearing apically two spines, lateral margins very convex and each bearing a spine near the distal end. Length of male 5 mm.

The female is like the male except that the palm and seventh joint of gnathopod 2 are apparently a little shorter, and uropod 3 is a little shorter. Length of female about 5 mm.

Twelve specimens were taken at the type locality, Frederiksted, St. Croix, Virgin Islands, from slightly brackish spring water in a deep well. One of these specimens, a male, U.S.N.M. No. 80027, is the type.

SYNPLEONIA PIZZINI Shoemaker

FIGURES 10, 11, 12

Synpleonia pizzini SHOEMAKER, 1938, Proc. Biol. Soc. Washington, vol. 51, p. 137.

The type locality for this species is a small spring known as Wetzel's Spring, on the side of a hill in Glover-Archbold Park just west of Georgetown, D. C. It is a blind subterranean species which occurs at the surface of the earth only where the underground waters emerge as springs, seepages, and wells. A fully mature female was taken from a well on an island in the Potomac River about a mile above

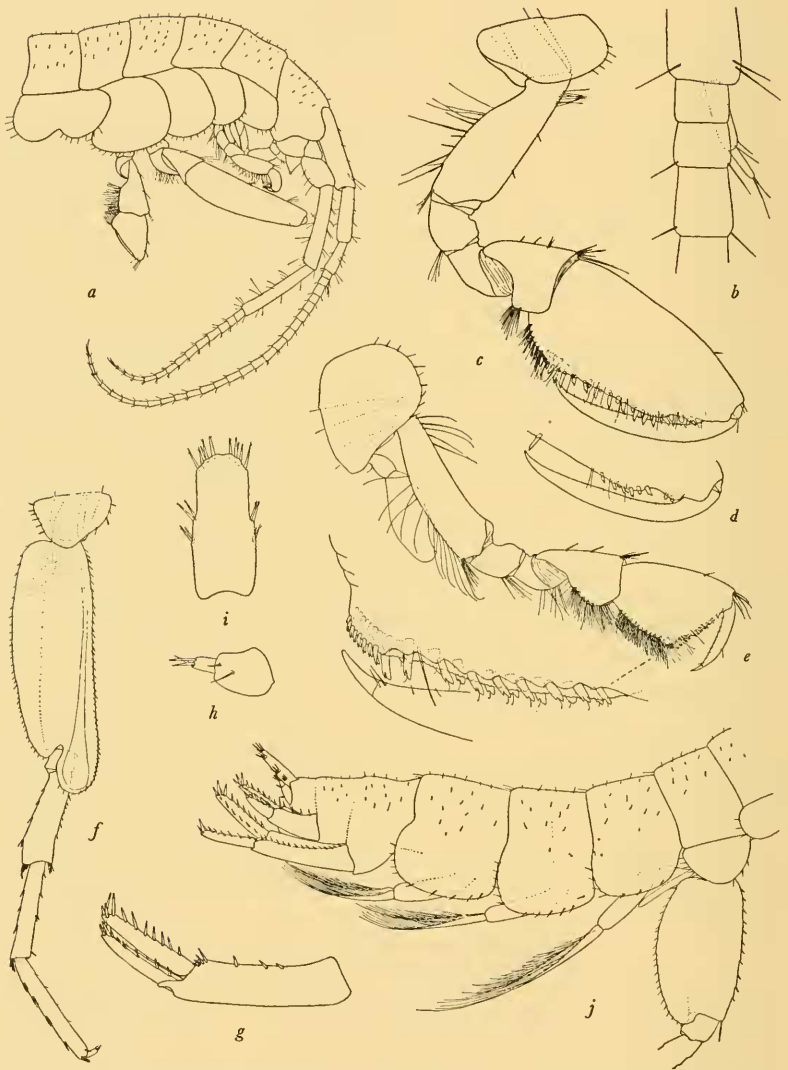


FIG. 10.—*Synpleonia pizzini* Shoemaker. Male: *a*, front end of animal; *b*, antenna 1; *c*, gnathopod 1; *d*, palm of gnathopod 1 of another male; *e*, gnathopod 2; *f*, pereopod 5; *g*, uropod 1, inside view; *h*, uropod 3; *i*, telson. Female: *j*, hind end of animal.

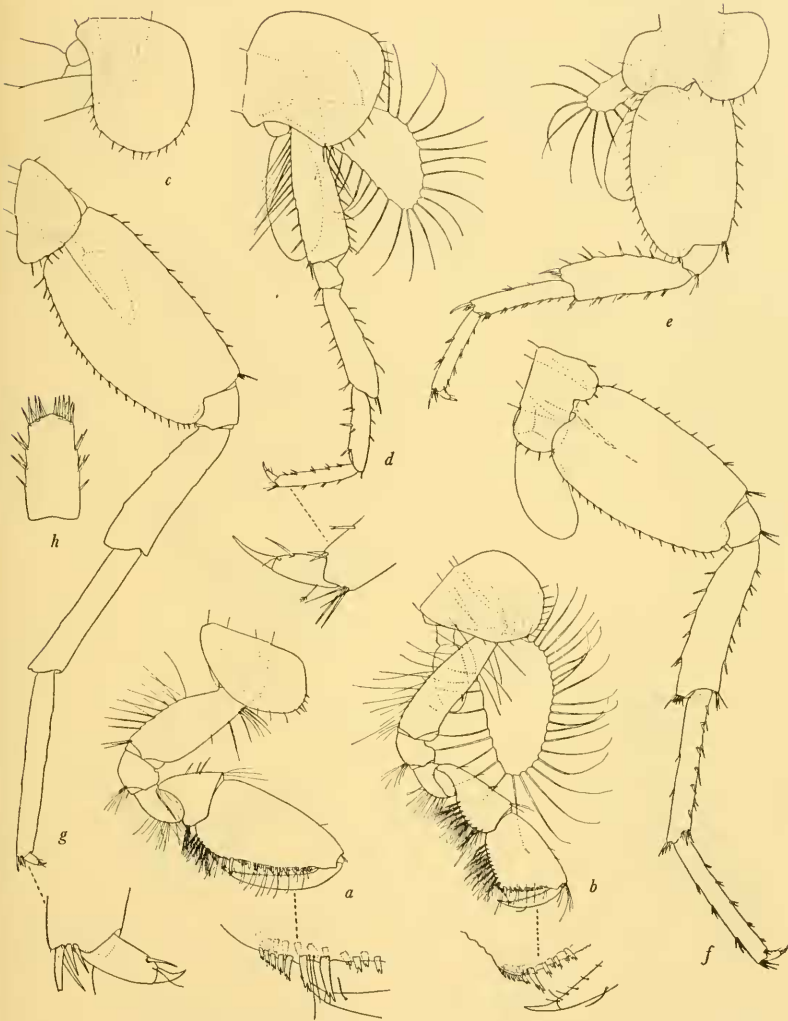


FIG. 11.—*Synpleonia pizzini* Shoemaker. Female: *a*, gnathopod 1; *b*, gnathopod 2; *c*, coxal plate of pereopod 1; *d*, pereopod 2; *e*, pereopod 3; *f*, pereopod 4; *g*, pereopod 5; *h*, telson.

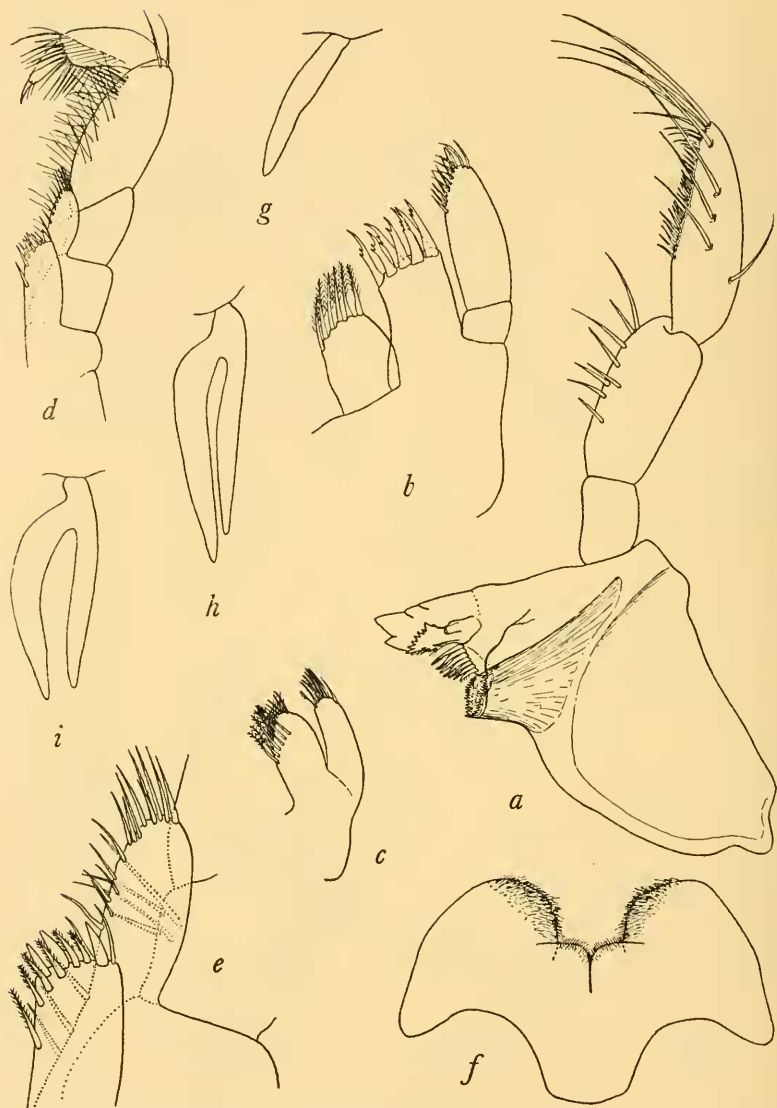


FIG. 12.—*Symplectonia pizzini* Shoemaker. Female: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxilliped; *e*, inner and outer plates of maxilliped, greatly enlarged; *f*, lower lip; *g*, median sternal gill of second thoracic segment; *h*, bifurcate lateral sternal gill of sixth thoracic segment; *i*, bifurcate lateral sternal gill of seventh thoracic segment.

Cabin John Bridge, Md. As this island is composed of rock and sand, it was thought that the well was supplied by seepage water from the river, until the discovery of this specimen of *Synpleonia pizzini* which proved that the water was derived from a subterranean vein.

Synpleonia pizzini has been taken in Virginia in a spring near Scott Run, and a spring at Bullneck Run, Fairfax County, and from a well the locality of which is not given. In Pennsylvania it has been taken in Refton Cave, and in the seepage of subterranean water in Lancaster County; at Johnson (Upper) Cave, Center County; at Barton Cave and Dulany Cave, Fayette County; and from a small walled spring near New Centerville, Chester County.

As far as known, this species appears to have a rather restricted range and has, up to the present time, been taken only in the District of Columbia, Virginia in the vicinity of Washington, and southern Pennsylvania. The genus *Synpleonia*, however, has a wide range and is represented by a number of species which are differentiated by rather obscure and subtle characters which are more difficult to express in words than in drawings. I am, therefore, figuring *S. pizzini*, in order that its characters may be presented in a more exact and graphic form.